



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2002VT1B

Title: Water quantity and quality dynamics in high-elevation watersheds: Developing a scientific approach to understanding ski area impacts in Vermont

Project Type: Research

Focus Categories: Hydrology, Water Quality, Models

Keywords: ski areas, snowmaking, suspended sediment, Vermont

Start Date: 03/01/2002

End Date: 02/28/2004

Federal Funds Requested: \$29880.00

Matching Funds: \$61996.00

Congressional District: First

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Abstract: The ski industry in Vermont faces important demands in maintaining viability of their operations, posing significant challenges for environmental assessment. Transient and unpredictable snow conditions throughout the northeast motivate the need for snowmaking at alpine resorts. Snowmaking reduces in-stream flow during the critical winter low-flow period, posing the risk of freezing to overwintering fish eggs of fall spawners, such as trout. Competitive pressures from western resorts have driven proposals for expansion plans, anchored by slope-side villages, hotel complexes and year-round amenities such as golf courses. In the last several years, a number of ski resorts in Vermont have proposed or initiated major expansion projects, including Stratton, Killington/Pico, Okemo, and Stowe. District Environmental Commissioners, who review Act 250 development permits, and the Vermont Agency of Natural Resources (ANR), which permits water supply and wastewater systems, are charged with evaluating the effects of existing and proposed development on water quality and quantity. Environmental provisions in these permits generally rely on Best Management Practices (BMPs) and common sense approaches, due to the lack of scientific information. A central concern of ski resort development is the potential enhancement of flow peaks. An increase in the frequency and magnitude of

high flows can cause readjustment of stream channels, destabilization of stream banks, and degradation of fish habitat as erosion and sediment deposition occur. Trail clearing, service road construction, snowmaking, and creation of impervious surfaces at resort facilities each may potentially contribute to enhanced peak flows. In the case of snowmaking, the artificially-enhanced snowpack prolongs the spring snowmelt season and may increase the likelihood of flooding by rain-on-snow under wet antecedent conditions. Little is known about the relative importance and interplay of these factors in the ski area environment. There have been no significant scientific studies in Vermont that assess the effects of high-elevation development on water quality, quantity, or sedimentation that can be used to help set criteria for approving or rejecting permits. This proposal seeks to study the impacts of alpine ski resort operations on water quantity and quality through a combination of field monitoring and simulation modeling. We propose building on a recently established stream gaging program, initiated by the U.S. Geological Survey (USGS) in cooperation with the Vermont Monitoring Cooperative (VMC), to examine stream flow dynamics and material export in two high-elevation watersheds in Vermont.

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